Attorney Docket: 313KA/36119CO
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: TORU TAKAMIZAWA ET AL.

Serial No.: 08/620,541 Group Art Unit: 3503

Filed: MARCH 25, 1996 Examiner: Lenard A. Footland

Title: PRELOADING METHOD FOR PRELOAD-ADJUSTABLE ROLLING BEARING AND MANUFACTURE OF THE SAME

AMENDMENT UNDER 37 C.F.R. § 1.115

Box
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This Amendment is accompanied by a petition under 37 C.F.R. §1.136(a) for a three-month extension of time and by a check in the amount of $930.00 in payment of the required extension fee.

The following amendments and remarks are respectfully submitted in connection with the above-referenced application in response to the Office Action mailed January 29, 1997.

IN THE SPECIFICATION:

Page 2, line 2, change "groove" to --grooves--.

line 9, change "12(A)" to --12(C)--.

Page 6, lines 18-19 delete "or shrinkage".

Page 14, line 3, change "baring" to --bearing--.

Page 20, line 6, change "has" to --have--.

Page 45, line 2, change "preloa-adjustable" to --preload-adjustable--.

IN THE CLAIMS:

Please amend the claims as follows:

-- 58. (Amended) A preload-controllable bearing apparatus comprising first and second members which are [relatively] rotatable relative to each other,

the first member having spaced apart first and second raceways which are axially fixed [in a direction to come closer] relative to each other [with reference to the first member],

the second member having a first race with a third raceway which is opposed to the first raceway of the first member with a first ball row therebetween, and a second race with a fourth raceway which is opposed to the second raceway of the first member with a second ball row therebetween,

the first race with the third raceway being fixed relative to the second member and being axially [in a direction to be] separated from the second race with the fourth raceway [with reference to the second member],

the second race with the fourth raceway being fitted to the second member with an interference so as to be [relatively] movable relative to each other,

the interference causing a force against movement which is larger than the axial reaction force to a preload to be exerted through the first raceway, the first ball row, the third raceway, the fourth raceway, the second ball row, the second raceway and the first raceway,

the preload being adjustable based on an axial pressure to be applied to between the fourth raceway and the second member,

the first member being an outer ring while the second member being a shaft extending through the outer ring, and

at least one of the [third and fourth raceways] first and second races being an independent member fitted to the shaft.

59. (Amended) A preload-controllable bearing apparatus comprising first and second members which are [relatively] rotatable relative to each other,

the first member having spaced apart first and second raceways which are axially fixed [in a direction to come closer] relative to each other [with reference to the first member],

the second member having a first race with a third raceway which is opposed to the first raceway of the first member with a first ball row therebetween, and a second race with a fourth raceway which is opposed to the second raceway of the first member with a second ball row therebetween,

the first race with the third raceway and the second race with the fourth [raceways] raceway being fitted to the second

member with an interference so as to be [relatively] movable relative to each other,

the interference causing a force against movement which is larger than the axial reaction force to a preload to be exerted through the first raceway, the first ball row, the third raceway, the fourth raceway, the second ball row, the second raceway and the first raceway,

the preload being adjustable based on an axial pressure to be applied to between the [fourth] third raceway and the fourth raceway,

the first member being an outer ring while the second member being a shaft extending through the outer ring, and

at least one of the [third and fourth raceways] first and second races being an independent member fitted to the shaft.

60. (Twice Amended) The preload-controllable bearing apparatus of Claim 58 or 59, wherein each of the raceways has an arcuate shape in cross section.

61. (Twice Amended) The preload-controllable bearing apparatus of Claim 58 or 59, wherein the [fourth raceway] second race has a first side face and the [third raceway] first race has a second side face such that the first and second side faces are opposed to each other with a gap therebetween.

63. (Twice Amended) The preload-controllable bearing apparatus of Claim 58 or 59, wherein the raceways [is] are a type of deep groove.

67. (Amended) A preload-controllable bearing apparatus comprising first and second members which are [relatively] rotatable relative to each other,

the first member having spaced apart first and second raceways which are axially fixed [in a direction to come closer] relative to each other [with reference to the first member],

the second member having a first race with a third raceway which is opposed to the first raceway of the first member with a first ball row therebetween, and a second race with a fourth raceway which is opposed to the second raceway of the first member with a second ball row therebetween,

the first race with the third raceway being fixed relative to the second member and being axially [in a direction to be] separated from the second race with the fourth raceway [with reference to the second member],

the second race with the fourth raceway being fitted to the second member with an interference so as to be [relatively] movable relative to each other,

the interference causing a force against movement which is larger than the axial reaction force to a preload to be exerted through the first raceway, the first ball row, the third raceway,

the fourth raceway, the second ball row, the second raceway and the first raceway,

the preload being adjustable based on an axial pressure to be applied to between the fourth raceway and the second member,

the first member being an outer ring while the second member being a shaft extending through the outer ring, and the raceways having an arcuate shape in cross section.

68. (Amended) A preload-controllable bearing apparatus comprising first and second members which are [relatively] rotatable relative to each other,

the first member having spaced apart first and second raceways which are axially fixed [in a direction to come closer] relative to each other [with reference to the first member],

the second member having a first race with a third raceway which is opposed to the first raceway of the first member with a first ball row therebetween, and a second race with a fourth raceway which is opposed to the second raceway of the first member with a second ball row therebetween,

the first race with the third raceway and the second race with the fourth [raceways] raceway being fitted to the second member with an interference so as to be [relatively] movable relative to each other,

the interference causing a force against movement which is larger than the axial reaction force to a preload to be exerted through the first raceway, the first ball row, the third raceway,

the fourth raceway, the second ball row, the second raceway and the first raceway,

the preload being adjustable based on an axial pressure to be applied to between the third raceway and the fourth raceway,

the first member being an outer ring while the second member being a shaft extending through the outer ring, the raceways having an arcuate shape in cross section.

69. (Twice Amended) The preload-controllable bearing of Claim 67 or 68, wherein the [fourth raceway] second race has a first side face and the [third raceway] first race has a second side face such that the first and second side faces are opposed to each other with a gap therebetween.

75. (Twice Amended) The preload-controllable bearing of Claim 67 or 68, the [third and fourth raceways] first and second races each being an independent member fitted to the shaft. --

IN THE DRAWINGS:

A proposed drawing change is submitted herewith, along with a separate letter to the Official Draftsperson.

REMARKS

It is respectfully requested that the Examiner in charge of this application telephone the undersigned attorney at (202) 628-8800 to schedule a personal Interview prior to taking action on this application.

The specification has been amended to correct minor typographical errors.

A proposed drawing change is submitted herewith, which merely corrects the reference number pointing to the outer race in drawing Figure 5(B) from "15" to --19--, as clearly understood from drawing Figure 7 and from page 28, line 21 through page 29, line 1. No new matter is included.

Responsive to the rejection of claims 58-66, 68, and (69-75)/68 under 35 U.S.C. § 112, second paragraph, the claims have been amended to more particularly point out and distinctly claim the subject matter which applicants regard as the invention. Specifically, all independent claims have been amended to recite that the second member has a first race with a third raceway which is opposed to the first raceway of the first member with a first ball row therebetween, and a second race with a fourth raceway which is opposed to the second raceway of the first member with a second ball row therebetween. Claims 58 and 59 have been amended to clarify that at least one of the first and second races is an independent member fitted to the shaft. In view of the above, reconsideration and withdrawal of this rejection are earnestly solicited.

It is respectfully submitted that instant claim 67 reads on the elected species. Accordingly, consideration of claims 67 and (69-75)/67, previously withdrawn from consideration as being drawn to non-elected species, is respectfully requested.

The rejection of claims 58-66, 68 and (68-75)/68 under 35 U.S.C. § 102(b) as being anticipated by Kitahara et al is traversed. Reconsideration and withdrawal of this rejection are earnestly solicited in view of the following remarks.

The present invention is directed to preload-controllable bearing apparatus including, *inter alia*, first and second members which are rotatable relative to each other. The first member has spaced apart first and second raceways which are axially fixed relative to each other. The second member has a first race with a third raceway which is opposed to the first raceway of the first member with a first ball row therebetween, and a second race with a fourth raceway which is opposed to the second raceway of the first member with a second ball row therebetween.

As recited in instant claims 58 and 67, the first race with the third raceway is fixed relative to the second member and is axially separated from the second race with the fourth raceway, and the second race with the fourth raceway is fitted to the second member with an interference so as to be movable relative to each other. The interference causes a force against movement which is larger than the axial reaction force to a preload to be exerted through the first raceway, the first ball row, the third raceway, the fourth raceway, the second ball row, the second

raceway and the first raceway. The preload is adjustable based on an axial pressure to be applied to between the fourth raceway and the second member.

As recited in instant claims 59 and 68, the first race with the third raceway and the second race with the fourth raceway are fitted to the second member with an interference so as to be movable relative to each other. The interference causes a force against movement which is larger than the axial reaction force to a preload to be exerted through the first raceway, the first ball row, the third raceway, the fourth raceway, the second ball row, the second raceway and the first raceway. The preload is adjustable based on an axial pressure to be applied to between the first race with the third raceway and the second race with the fourth raceway.

Kitahara et al relates to a drive motor for magnetic disks. Figure 8 of Kitahara et al shows a bearing having inner races 57, 62 and outer races 58, 63 which are mounted on a center shaft 72 and a rotor frame 12a by a press fit or with adhesive. Kitahara et al do not disclose or suggest a second race with a fourth raceway being fitted to a second member with an interference so as to be movable relative to each other, as recited in instant claims 58 and 67. Furthermore, Kitahara et al do not disclose or suggest a first race with a third raceway and a second race with the fourth raceway being fitted to a second member with an interference so as to be movable relative to each other, as recited in instant claims 59 and 68. In addition, Kitahara et

al do not disclose or suggest an interference causing a force against movement which is larger than the axial reaction force to a preload to be exerted through the first raceway, the first ball row, the third raceway, the fourth raceway, the second ball row, the second raceway and the first raceway, as recited in instant claims 58, 59, 67 and 68. In one embodiment, Kitahara et al describe misaligning the inner race 62 from the outer race 63 by adhesively securing the bearings on the rotor surface 12a and on the center shaft 72 while applying an external force to the inner race 56 of the upper bearing, an internal reaction force being responsively applied to the lower bearing 61 by the middle spacer 74. Since an adhesive connection is used, Kitahara et al do not have an adjustable preload due to the interference fit, as recited in the instant claims.

In view of the above, reconsideration and withdrawal of this rejection are earnestly solicited.

The alternative rejection of claims 71/68, 72/68, 73/68, and 74/68 under 35 U.S.C. § 103 as being unpatentable over Kitahara et al and further in view of administrative notice of common knowledge in the art. As discussed above, the instant claims distinguish over Kitahara et al. Furthermore, absent prior art showing that the features of these claims are well known in the art, the rejection is unsupported and must be withdrawn. Accordingly, reconsideration and withdrawal of this rejection are earnestly solicited.

In light of the foregoing amendments and remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #313KA/36119CO).

Respectfully submitted,

July 29, 1997

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